

EXHIBIT 15

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

TQ DELTA, LLC,

Plaintiff,

v.

2WIRE, INC.,

Defendant.

Civil Action No. 1:13-cv-01835-RGA

TQ DELTA, LLC,

Plaintiff,

v.

ZYXEL COMMUNICATIONS, INC
and
ZYXEL COMMUNICATIONS
CORPORATION,

Defendants.

Civil Action No. 1:13-cv-02013-RGA

TQ DELTA, LLC,

Plaintiff,

v.

ADTRAN, INC.,

Defendant.

Civil Action No. 1:14-cv-00954-RGA

ADTRAN, INC.,

Plaintiff,

v.

TQ DELTA, LLC,

Defendant.

Civil Action No. 1:15-cv-00121-RGA

MEMORANDUM OPINION

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January 29, 2018


 ANDREWS, U.S. DISTRICT JUDGE:

Presently before the Court is the issue of claim construction of multiple terms in U.S. Patent Nos. 7,292,627 (“the ’627 patent”), 8,073,041 (“the ’041 patent”), 8,090,008 (“the ’008 patent”), 8,218,610 (“the ’610 patent”), and 8,355,427 (“the ’427 patent”). The Court has considered the parties’ joint claim construction brief. (Civ. Act. No. 13-01835-RGA, D.I. 362; Civ. Act. No. 13-02013-RGA, D.I. 348; Civ. Act. No. 14-00954-RGA, D.I. 202; Civ. Act. No. 15-00121-RGA, D.I. 204).¹ The Court heard oral argument on November 30, 2017. (D.I. 452) (“Tr.”).

I. BACKGROUND

The patents-in-suit represent “Family 4” of the patents that Plaintiff has asserted against Defendants. (D.I. 362 at 8). They all share a common specification. (*Id.* at 18). They relate to a system and method for scrambling the phase characteristics of carrier signals.

II. LEGAL STANDARD

“It is a bedrock principle of patent law that the claims of a patent define the invention to which the patentee is entitled the right to exclude.” *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc). “[T]here is no magic formula or catechism for conducting claim construction.’ Instead, the court is free to attach the appropriate weight to appropriate sources ‘in light of the statutes and policies that inform patent law.’” *SoftView LLC v. Apple Inc.*, 2013 WL 4758195, at *1 (D. Del. Sept. 4, 2013) (quoting *Phillips*, 415 F.3d at 1324) (alteration in original). When construing patent claims, a court considers the literal language of the claim, the patent specification, and the prosecution history. *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979–80 (Fed. Cir. 1995) (en banc), *aff’d*, 517 U.S. 370 (1996). Of these sources, “the

¹ Unless otherwise noted, all references to the docket refer to Civil Action No. 13-1835-RGA.

specification is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.” *Phillips*, 415 F.3d at 1315.

“[T]he words of a claim are generally given their ordinary and customary meaning. . . . [Which is] the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention, i.e., as of the effective filing date of the patent application.” *Id.* at 1312–13. “[T]he ordinary meaning of a claim term is its meaning to [an] ordinary artisan after reading the entire patent.” *Id.* at 1321. “In some cases, the ordinary meaning of claim language as understood by a person of skill in the art may be readily apparent even to lay judges, and claim construction in such cases involves little more than the application of the widely accepted meaning of commonly understood words.” *Id.* at 1314.

When a court relies solely upon the intrinsic evidence—the patent claims, the specification, and the prosecution history—the court’s construction is a determination of law. *See Teva Pharms. USA, Inc. v. Sandoz, Inc.*, 135 S. Ct. 831, 841 (2015). The court may also make factual findings based upon consideration of extrinsic evidence, which “consists of all evidence external to the patent and prosecution history, including expert and inventor testimony, dictionaries, and learned treatises.” *Phillips*, 415 F.3d at 1317–19. Extrinsic evidence may assist the court in understanding the underlying technology, the meaning of terms to one skilled in the art, and how the invention works. *Id.* Extrinsic evidence, however, is less reliable and less useful in claim construction than the patent and its prosecution history. *Id.*

“A claim construction is persuasive, not because it follows a certain rule, but because it defines terms in the context of the whole patent.” *Renishaw PLC v. Marposs Societa’ per Azioni*, 158 F.3d 1243, 1250 (Fed. Cir. 1998). It follows that “a claim interpretation that would

exclude the inventor's device is rarely the correct interpretation." *Osram GMBH v. Int'l Trade Comm'n*, 505 F.3d 1351, 1358 (Fed. Cir. 2007).

III. PATENTS-AT-ISSUE

Claim 1 from the '041 patent and claim 1 from the '008 patent are relevant for the purposes of claim construction. Claim 1 of the '041 patent reads as follows:

1. A method, in a first multicarrier *transceiver* that uses a plurality of carrier signals for receiving a bit stream, wherein each carrier signal has a phase characteristic associated with the bit stream, the method comprising:

receiving the bit stream, wherein:

each carrier signal is associated with a value determined independently of any bit value of the bit stream carried by that respective carrier signal, the value associated with each carrier signal determined by a pseudo-random number generator,

a phase shift for each carrier signal is based on:

the value associated with that carrier signal, and

the combining of a phase for each carrier signal with the phase characteristic of that respective carrier signal so as to substantially scramble the phase characteristics of the plurality of carrier signals, and

multiple carrier signals corresponding to the plurality of phase shifted and scrambled carrier signals are used by the first multicarrier transceiver to demodulate a same bit value of the received bit stream

('041 patent, claim 1) (disputed terms italicized). Claim 1 of the '008 patent reads:

1. A method for scrambling phase characteristics of carrier signals in a first multicarrier *transceiver* that uses a plurality of *carrier signals for modulating a bit stream*, wherein each carrier signal has a phase characteristic associated with the bit stream, the method comprising:

associating each carrier signal with a value determined independently of any bit value of the bit stream carried by that respective carrier signal, the value associated with each carrier signal determined using a pseudo-random number generator; *computing a phase shift for each carrier signal based on the value associated with that carrier signal; and*

combining the *phase shift* computed for each respective carrier signal with the phase characteristic of that carrier signal so as to *substantially*

scramble the phase characteristics of the plurality of carrier signals, wherein multiple carrier signals corresponding to the scrambled carrier signals are used by the first multicarrier transceiver to modulate the same bit value.

('008 patent, claim 1) (disputed terms italicized).

IV. CONSTRUCTION OF DISPUTED TERMS

1. “transceiver” ('627 patent, claims 20 and 26; '041 patent, claims 1 and 14; '008 patent, claims 1 and 14; '610 patent, claims 7 and 31; '427 patent, claims 7 and 29)

- a. *Plaintiff's proposed construction*: “communications device capable of transmitting and receiving data wherein the transmitter portion and receiver portion share at least some common circuitry”
- b. *Defendants' proposed construction*: “communications device capable of transmitting and receiving data”
- c. *Court's construction*: to be announced

The parties' Family 4 arguments for “transceiver” appear to be more or the less the same as those made for Families 1, 2, and 3. I will construe “transceiver” as I do for those Families.

2. “scramble the phase characteristics of the plurality of carrier signals” ('627 patent, claims 20 and 26; '041 patent, claims 1 and 14; '008 patent, claims 1 and 14; '610 patent, claims 7 and 31; '427 patent, claims 7 and 29)

- a. *Plaintiff's proposed construction*: “adjust the phase characteristics of the carrier signals by pseudo-randomly varying amounts”
- b. *Plaintiff's modified construction*: “adjust the phase characteristics of the carrier signals by varying amounts amongst the carriers”
- c. *Defendants' proposed construction*: “adjust the phase characteristics of each of the plurality of carrier signals”
- d. *Defendants' modified construction*: “adjust the phase characteristics of each of the plurality of carrier signals by varying amounts”
- e. *Court's construction*: “adjust the phase characteristics of the carrier signals by varying amounts”

Both parties have moved away from their original proposed constructions. In particular, Plaintiff no longer maintains that “pseudo-randomly” should be included in the construction for this term. (*See* Tr. at 20:12–14). Further, in their sur-reply, Defendants added “by varying amounts” to their proposal. (D.I. 362 at 63).

There are two remaining disagreements between the parties. First, the parties dispute whether the construction should include “amongst the carriers.” Second, they dispute whether it should include “each of the plurality.”

With respect to the first dispute, I am not persuaded by Plaintiff’s argument that the construction should include “amongst the carriers.” As Plaintiff recognized at the *Markman* hearing, the Family 4 patent specifications include embodiments with variation from carrier to carrier, as well as variation over time, that is, from DMT symbol to DMT symbol. (*See* Tr. at 23:9–12; *see also, e.g.*, ’627 patent, 6:17–31). Thus, the specifications make clear that adjustment of the phase characteristics need not vary only amongst the carriers.

As to the second dispute, I am not persuaded by Defendants’ argument that “each of the plurality” of carrier signals must undergo a phase adjustment of a non-zero amount. (*See* Tr. at 40:1–7). Other than arguing that the term “phase shift” implies a non-zero adjustment, Defendants have identified no intrinsic evidence to support their contention that a “phase shift” has not occurred when the equation used to determine the adjustment generates a zero.

For the reasons stated above, I will construe this term to mean, “adjust the phase characteristics of the carrier signals by varying amounts.”

3. “substantially scramble the phase characteristics of the plurality of carrier signals” (’627 patent, claims 20 and 26; ’041 patent, claims 1 and 14; ’008 patent, claims 1 and 14; ’610 patent, claims 7 and 31; ’427 patent, claims 7 and 29)
- a. *Plaintiff’s proposed construction*: “the phase characteristics of the carrier signals are scrambled to produce a transmission signal with a reduced peak-to-average power ratio (PAR)”
 - b. *Defendants’ proposed construction*: indefinite
 - c. *Defendants’ alternative construction*:² “adjust the phase characteristic of each of the plurality of carrier signals by varying amounts to produce a transmission signal that has a Gaussian probability distribution”
 - d. *Court’s construction*: “adjust the phase characteristics of the carrier signals by varying amounts to produce a transmission signal with a reduced peak-to-average power ratio (PAR)”

The parties dispute whether the word “substantially” renders this term indefinite. Plaintiff argues, “Without a doubt, claim terms including the word ‘substantially’ are susceptible to construction, especially where there is specific support in the specification.” (D.I. 362 at 56). According to Plaintiff, the specification of the Family 4 patents “clearly and repeatedly explains to a person having ordinary skill in the art” that this term “means that a transmission signal is produced with a reduced PAR.” (*Id.* at 57).

Defendants counter by arguing, “This term is indefinite because it includes a term of degree—‘substantially’—and the specification does not provide any guidance to inform a person of ordinary skill in the art how to evaluate whether the term is met.” (*Id.* at 58). Specifically, Defendants assert that the specification repeatedly refers to “substantially scrambled” carrier signals but never “illuminat[es] how much scrambling is required.” (*Id.* at 59). According to Defendants, Plaintiff’s proposed construction is improper because “the specification does not

² (D.I. 422 at 2).

describe how ‘substantially scrambled’ the carrier signals should be to result in a ‘reduced PAR.’” (*Id.*).

I am not convinced by Defendants’ argument that this term is indefinite because the word “substantially” fails to inform one of ordinary skill in the art with “reasonable certainty” the scope of the invention. *See Nautilus, Inc. v. Biosig Instruments, Inc.*, 134 S. Ct. 2120, 2124 (2014). The Federal Circuit has never held that terms of degree, like “substantially,” are “inherently indefinite.” *See Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1370 (Fed. Cir. 2014). To the contrary, claims using terms of degree may be found definite where they “provid[e] enough certainty to one of skill in the art when read in the context of the invention.” *Id.*

As I understand from the supplemental expert declarations submitted by the parties, any amount of scrambling of the phase characteristics does not necessarily result in a reduction of PAR, that is, a PAR that is lower than it would have been had no scrambling been performed. (*See* D.I. 451 at 3 ¶ 9; D.I. 449 at 2 ¶ 2). Further, as Defendants’ expert, Dr. Zimmerman, has explained, “While the ’627 patent does not explicitly address the possibility of the DMT symbol with the scrambled phase characteristics having a higher PAR, the specification allows that scrambling the phase characteristics may result in an increased PAR.” (D.I. 449 at 3 ¶ 4). It makes sense, therefore, that the word “substantially” relates not to whether PAR has actually been reduced, if at all, but to how much scrambling one would perform with the object of reducing PAR.

In light of the supplemental declaration of Plaintiff’s expert, Dr. Cooklev, I am persuaded that a person of ordinary skill in the art would understand how much scrambling one would perform to “substantially scramble,” that is, to scramble the phase characteristics with the object of reducing PAR. Dr. Cooklev explains, among other things, that “scrambling is performed by combining (*i.e.*, adding) another phase (a scrambling phase) to the phase characteristic of a given

4-QAM symbol. The scrambling phase to be added to the phase characteristic is selected from one of 0, $\pi/2$, π , or $3\pi/2$.” (D.I. 451 at 5 ¶ 14). Dr. Cooklev goes on to demonstrate how one would scramble the phase characteristics to achieve a reduced PAR. (*See id.* at 5–6 ¶ 15).

Nor am I persuaded by Defendants’ argument that the term is indefinite because the patent specifications describe the effect of scrambling on PAR in different ways. In particular, the patents refer to “a low par” (’627 patent, 2:25), “a reduced peak-to-average power ratio (PAR)” (*id.* at 2:44–45), and “a substantially minimized peak-to-average (PAR) power ratio” (*id.* at 4:41–42). As I understand it, however, the specifications indicate that, at a minimum, the goal is to reduce PAR. (*See, e.g., id.* at abstract, 1:19–22, 2:41–45, 6:55–59). Therefore, I do not think the fact that the patents refer to the varying extents to which PAR may be reduced as a result of scrambling is reason to find the term indefinite.

Since this term encompasses the previous term, I will incorporate my construction for the previous term into the construction for this term. Accordingly, this term is construed to mean, “adjust the phase characteristics of the carrier signals by varying amounts to produce a transmission signal with a reduced peak-to-average power ratio (PAR).”

4. “multiple carrier signals corresponding to the plurality of phase shifted and scrambled carrier signals are used by the first [multicarrier] transceiver to demodulate a same [input] bit value of the received bit stream” (’041 patent, claims 1 and 14; ’610 patent, claims 7 and 31; ’427 patent, claims 7 and 29)

- a. *Plaintiff’s proposed construction*: “a first carrier signal is used by the first multicarrier transceiver to demodulate the value of a bit of the received bit stream and at least one more carrier signal is used by the first multicarrier transceiver to demodulate the value of the same bit of the received bit stream, wherein the carrier signals correspond to the plurality of phase-shifted and scrambled carrier signals”
- b. *Defendants’ proposed construction*: indefinite

- c. *Defendants' alternative construction*:³ “a first carrier signal is used by the first multicarrier transceiver to demodulate the value of a bit of the received bit stream and at least one more carrier signal is used by the first multicarrier transceiver to demodulate a bit of the received bit stream having the same value, wherein the carrier signals correspond to the plurality of phase-shifted and scrambled carrier signals”
- d. *Court's construction*: “a first carrier signal is used by the first multicarrier transceiver to demodulate the value of a bit of the received bit stream and at least one more carrier signal is used by the first multicarrier transceiver to demodulate the value of the same bit of the received bit stream, wherein the carrier signals correspond to the plurality of phase-shifted and scrambled carrier signals”

The parties dispute whether this term is indefinite. Plaintiff argues that Defendants' assertion that the term is indefinite is incorrect for two reasons. First, Plaintiff points out that the portions of the specification upon which Defendants rely do not refer to a “same bit value.” (D.I. 362 at 71). They refer only to “bit value” or “bit values.” (*Id.*). Thus, Plaintiff argues, Defendants have not cited to any intrinsic evidence supporting their contention that “same bit” and “same bit value” refer to two different bits or to the value of two different bits. (*Id.*). Second, Plaintiff argues that Defendants' second possibility for interpreting the term “same [input] bit value” is “unreasonably broad and would render the entire term superfluous.” (*Id.*).

Defendants counter that the term is indefinite because of a “lack of clarity as to whether the claims use the term ‘same [input] bit value’ in the manner described by Dr. Chrissan or whether it incorporates the different meaning ascribed to the term ‘bit value’ in the specification.” (*Id.* at 67). Defendants explain that Dr. Chrissan interprets “same [input] bit value” as a particular bit in a series of bits. (*Id.* at 68). The specification, on the other hand, uses the claim language “bit value” in a different way. (*Id.*). According to Defendants, a person of ordinary skill would understand “bit value” in the specification to mean “the value (1 or 0) of

³ (D.I. 422 at 3).

any given bit, rather than the specific position of the bit in the bit stream.” (*Id.* at 68–69).

Defendants contend that Plaintiff and Dr. Chrissan ignore this second possibility, despite Dr. Chrissan’s acknowledgment that “same bit” and “same bit value” do not mean the same thing. (*Id.* at 69). In light of the way “bit value” is used in the specification the scope of the claims would be much broader to include any transmission. (*Id.* at 70). Since “the specification fails to clarify what meaning ought to be ascribed to ‘same [input] bit value’ as used in the claims,” Defendants argue, “a person of ordinary skill would not be reasonably certain of the claim scope.” (*Id.*).

I am not persuaded by Defendants’ argument that this term is indefinite because the patent is ambiguous as to the meaning of “same [input] bit value.” (*Id.* at 67 (citing *Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014))). In my opinion, a person of ordinary skill in the art would read the term “same [input] bit value” as “value of the same bit.” As I understand it, once the phase characteristics of the carrier signals have been adjusted by the phase scrambler in the transmitting transceiver, they are then demodulated by the phase descrambler in the receiving transceiver. (*See, e.g.*, ’041 patent, 4:42–46; *see also* D.I. 365 at A327–28 ¶ 63). Thus, the transmitting transceiver and the receiving transceiver are complementary. The bit values that are demodulated on the receiving side mirror the bit values that are modulated on the transmitting side. It makes sense, therefore, that the term “same [input] bit value” refers to “value of the same bit.” Accordingly, I will adopt Plaintiff’s proposed construction.

5. “multiple carrier signals corresponding to the scrambled carrier signals are used by the first multicarrier transceiver to modulate the same bit value” (’008 patent, claims 1 and 14)

- a. *Plaintiff’s proposed construction*: “a first carrier signal is used by the first multicarrier transceiver to modulate the value of a bit and at least one more

carrier signal is used by the first multicarrier transceiver to modulate the value of the same bit, wherein the carrier signals correspond to the scrambled carrier signals”

- b. *Defendants’ proposed construction*: indefinite
- c. *Defendants’ alternative construction*:⁴ “a first carrier signal is used by the first multicarrier transceiver to modulate the value of a bit of the bit stream and at least one more carrier signal is used by the first multicarrier transceiver to modulate a bit of the bit stream having the same value, wherein the carrier signals correspond to the plurality of phase-shifted and scrambled carrier signals”
- d. *Court’s construction*: “a first carrier signal is used by the first multicarrier transceiver to modulate the value of a bit and at least one more carrier signal is used by the first multicarrier transceiver to modulate the value of the same bit, wherein the carrier signals correspond to the scrambled carrier signals”

Defendants argue this term “suffers from the same deficiencies” as the previous one. (D.I. 362 at 76). Therefore, it should also be found indefinite. (*Id.*). Plaintiff makes much of the same arguments in support of its proposed construction and against Defendants’ indefiniteness argument as it did for the previous term. (*See id.* at 75–76).

As I understand it, this term mirrors the previous term at the transmitting transceiver. I similarly do not think this term is indefinite. In my opinion, given that the transmitting and receiving transceivers are complementary, it makes sense that “same bit value” in the context of these patents refers to “value of the same bit.” Accordingly, I will adopt Plaintiff’s proposed construction.

6. “carrier signals for modulating an [input] bit stream” (’627 patent, claims 20 and 26; ’008 patent, claims 1 and 14)

- a. *Plaintiff’s proposed construction*: “carrier signals that are used by a multicarrier transceiver to modulate an input bit stream”
- b. *Defendants’ proposed construction*: “carrier signals that are used to modulate an input bit stream”

⁴ (D.I. 422 at 4).

- c. *Court's construction*: “carrier signals that are used to modulate an input bit stream”

The parties dispute whether the language “by a multicarrier transceiver” should be included in the construction for this term. Plaintiff argues its proposed construction “is based on the contextual claim language.” (*Id.* at 77). It points to claims and portions of the specifications from the '008 and '627 patents, which, Plaintiff argues, show “that a transceiver (*i.e.*, a multicarrier transceiver) is what uses the carrier signals for modulating an input bit stream.” (*Id.* at 77–78). The core of Defendants' argument in response is that the additional language proposed by Plaintiff is unnecessary. (*See id.*).

As Plaintiff acknowledged at oral argument (Tr. at 111:12–14) and in its opening position in the parties' joint brief (D.I. 362 at 77), the claims make clear that the multicarrier transceiver uses the carrier signals to modulate a bit stream. For example, claim 20 in the '627 patent recites, “A multicarrier modulation transceiver that uses a transmission signal having a plurality of carrier signals for modulating an input bit stream” ('627 patent, 11:62–12:1; *see also* '008 patent, 10:59–61, 11:41–42). I agree with Defendants, therefore, that including “by a multicarrier transceiver” in the construction would be redundant and thus unnecessary.

Accordingly, I will adopt Defendants' proposed construction, “carrier signals that are used to modulate an input bit stream.”

7. “phase shift” ('627 patent, claims 20 and 26; '041 patent, claims 1 and 14; '008 patent, claims 1 and 14; '610 patent, claims 7 and 31; '427 patent, claims 7 and 29)

- a. *Plaintiff's proposed construction*: “the amount by which a phase is (or will be) shifted”
- b. *Defendants Adtran and Zyxel's proposed construction*: “the amount by which to adjust the phase”

- c. *Defendant 2Wire's proposed construction*: “angle by which the phase of a carrier signal is rotated”
- d. *Court's construction*: “the amount by which a phase is adjusted”

To support its proposed construction, Plaintiff argues, “The claims themselves demonstrate that ‘phase shift’ applies to phases that are already shifted (retrospective), phases that will be shifted (prospective), and phases that are presently being shifted (contemporaneous).” (D.I. 362 at 80). Plaintiff asserts that both of Defendants’ proposed constructions are improper because they fail to encompass all three scenarios of phase shifting. (*See id.* at 81–82). According to Plaintiff, Defendants Adtran and Zyxel’s proposed construction is insufficient because it covers only “prospective phase shifts.” (*Id.* at 81). Defendant 2Wire’s proposal is insufficient, argues Plaintiff, because it “only covers contemporaneous or retrospective phase shifts—*i.e.*, ‘*is* rotated.’” (*Id.* at 82).

In response, Defendants Adtran and Zyxel argue their construction is supported by the intrinsic record. (*Id.* at 82). Specifically, they point to several portions of the Family 4 specifications, which, according to Defendants, show that a “phase shift” is used to “adjust” the phase of a carrier signal. (*Id.*). They note also that both parties have proposed language “adjust” or “adjusting” in the construction for a similar term, “scramble the phase characteristics of the plurality of carrier signals.” (*Id.*). Further, Defendants argue that, contrary to Plaintiff’s contentions, the claim language itself already conveys the “‘retrospective’ nature of computing the phase shifts.” (*Id.* at 83). Thus, they argue, Plaintiff’s proposed language, “is (or will be),” is redundant. (*Id.*).

In support of its proposed construction, Defendant 2Wire argues that it “reflects the understanding of a person of ordinary skill in the art of Quadrature Amplitude Modulation.” (*Id.*). That the existing angle is rotated, 2Wire argues, is clear from the specification, “because it refers

to phase shift in the context of QAM, where the phase (or phase characteristic) would be understood to be an angle of rotation.” (*Id.* at 84). Finally, 2Wire argues that, contrary to Plaintiff’s assertions, “there is no need to redundantly convey whether the phase is to be shifted (transmitting) or had already been shifted (receiving).” (*Id.*).

I am not persuaded by Plaintiff’s argument that the words “or will be” are necessary in order to convey the prospective nature of some phase shifts. In my opinion, when read in the context of the claims, “the amount by which a phase is adjusted,” encompasses the retrospective, contemporaneous, and prospective nature of phase shifts.

Further, I have considered Defendant 2Wire’s argument separately, but I am convinced that “the amount by which a phase is adjusted” is a better construction for this term. While technically correct, 2Wire’s proposal suggests a narrowing over what is provided for in the patent. More specifically, an angle might be expressed in some way other than degrees.

For the reasons stated above, I will construe “phase shift” to mean “the amount by which a phase is adjusted.”

8. “a phase shift for each carrier is based on: . . . [the] combining of a phase for each carrier signal with the phase characteristic of that respective carrier signal” (’041 patent, claim 1; ’610 patent, claims 7 and 31; ’427 patent, claims 7 and 29)

- a. *Plaintiff’s proposed construction*: “a phase shift at the receiver for each carrier is based on . . . the previous combination, by a transmitting transceiver, of a phase for each carrier signal with the phase characteristic of that respective carrier signal”
- b. *Defendants’ proposed construction*: indefinite
- c. *Court’s construction*: “a phase shift at the receiver for each carrier is based on . . . the previous combination, by a transmitting transceiver, of a phase shift for each carrier signal with the phase characteristic of that respective carrier signal”

The parties dispute whether this term is indefinite because of a lack of clarity as to the meaning of the term “a phase.” To support its proposed construction, Plaintiff argues, “Because every claim in which this term appears is directed to a method for *receiving* or a receiving transceiver, a proper construction must consider a phase or a phase shift combination with a phase characteristic that was previously performed by a *transmitting* transceiver.” (*Id.* at 87). Plaintiff further notes that “the signal received by the receiving transceiver has *already (previously) been scrambled*—*i.e.*, phase shifts have already been applied.” (*Id.* at 88). In response to Defendants’ indefiniteness argument, Plaintiff asserts, “Defendants ignore the context of the words ‘phase’ and ‘phase characteristic’ . . . Furthermore, they misapprehend that ‘phase’ (or a ‘phase characteristic’) is ultimately represented by a number.” (*Id.* at 93).

Defendants respond by arguing that the term is indefinite because “a phase” has multiple possible meanings. (*Id.* at 89). First, according to Defendants, “a phase” could mean “the phase of that respective carrier signal.” (*Id.* at 90). It would make no sense, Defendants assert, for a phase to be combined with itself. (*Id.*). Second, Defendants explain that “a phase” could refer to a “phase shift.” (*Id.*). Again, Defendants assert that such a reading of “a phase” would be nonsensical. (*Id.* at 91). Third, Defendants state that “a phase” could have some meaning other than “phase shift” or “phase characteristic,” however, “there is no suggestion whatsoever in the specification as to what that meaning might be.” (*Id.* at 92). According to Defendants, Plaintiff’s expert, Dr. Chrissan, ignores the language, “phase shift for each carrier based on . . .” (*Id.* at 93). In so doing, Defendants contend, Dr. Chrissan “effectively replace[s] ‘a phase for each carrier signal’ that is combined with ‘the phase characteristic’ with either the very same phase shift which the method is supposed to arrive at, or, alternatively, some previously unmentioned and unknown phase shift.” (*Id.*).

I am not persuaded by Defendants' argument that this term is indefinite because there are multiple possible meanings of the term "phase." In light of the claims and the specifications, I think it makes the most sense that "phase" means "phase shift" in the asserted claims of the three patents where "phase" appears in the term under consideration. Plaintiff seemed to agree at the hearing that the construction for this term could use "phase shift" in place of "phase." (See Tr. at 97:1–4 ("Whether it's called a phase or a phase shift is really not relevant because both of them are – they are both a phase. Generically, a phase shift is a phase.")).

As I understand it, "phase shift[s]" occur at both the transmitting transceiver and the receiving transceiver. At the transmitting transceiver, which modulates an input bit stream, "the phase shift computed for each carrier signal [is combined] with the phase characteristic of that carrier signal so as to substantially scramble the phase characteristics of the plurality of carrier signals." (*E.g.*, '627 patent, 12:8–11). At the receiving transceiver, the carrier signals similarly undergo a "phase shift" that is based upon the "phase shift" that occurred in the transmitting transceiver. It makes sense, therefore, that "phase" would refer to the corresponding "phase shift" that was combined with a "phase characteristic" in the transmitting transceiver.

As Defendants pointed out at oral argument (Tr. at 94:6–18), there are other claims similarly related to a receiving transceiver that describe "the combining of a *phase shift* for each carrier signal with the phase characteristic of that respective carrier signal" (*e.g.*, '041 patent, claim 14 (emphasis added)). The presumption that "different words or phrases used in separate claims . . . indicate that the claims have different meanings and scope," therefore, would seem to counsel against finding "phase" to mean "phase shift." See *Starhome GmbH v. AT & T Mobility LLC*, 743 F.3d 849, 857–58 (Fed. Cir. 2014). The Federal Circuit has recognized, however, that this presumption is "not a hard and fast rule, but instead a rule of thumb that does not trump the clear

import of the specification.” *Id.* at 858. In my opinion, the specifications make clear that “phase” in the disputed limitation means “phase shift.” The specifications repeatedly refer to the combining of a “phase shift” with a “phase characteristic” in order to “substantially scramble the phase characteristics of the carrier signals.” (*E.g.*, ’041 patent, 2:37–40, 4:31–34). As Defendants point out, there is one sentence in the Background of the Invention that suggests “phase” could refer to “phase characteristic.” (*Id.* at 1:36–38 (“The DMT transmitter typically modulates the phase characteristic, or phase, and amplitude of the carrier signals. . . .”). I do not think this one sentence, however, trumps the patents’ repeated references to a “phase shift” being combined with a “phase characteristic.” Further, as Defendants asserted in the joint brief, construing “phase” to mean “phase characteristic” would be nonsensical, since such a construction would require a “phase” to be combined with itself. Such a construction would also render meaningless the patentee’s use of two different terms, “phase” and “phase characteristic,” in the same claim limitation.

Thus, I do not find this term indefinite. For the reasons stated above, I will construe it to mean, “a phase shift at the receiver for each carrier is based on . . . the previous combination, by a transmitting transceiver, of a phase shift for each carrier signal with the phase characteristic of that respective carrier signal.”

9. “computing a phase shift for each carrier signal” (’627 patent, claims 20 and 26; ’008 patent, claims 1 and 14)

- a. *Plaintiff’s proposed construction:* plain and ordinary meaning
- b. *Defendants’ proposed construction:* “computing an amount by which the phase of each carrier signal will be adjusted”
- c. *Court’s construction:* “computing the amount by which a phase is adjusted for each carrier signal”

Plaintiff argues this term needs no construction because the parties have already requested that the Court construe the term “phase shift.” (D.I. 362 at 97). In response, Defendants assert that their “proposed construction clarifies the term by incorporating their proposed construction for ‘phase shift.’” (*Id.*). Plaintiff counters that Defendants’ proposed construction for this term is inconsistent with its proposal for “phase shift.” (*Id.*). Defendants respond by arguing that “the slight changes in wording from [their] stand-alone constructions of ‘phase-shift,’ . . . to a phrasing that specifically addresses the prospective application of the phase shift in this particular usage is entirely logical and appropriate in context.” (*Id.* at 98).

I agree with Defendants that incorporating the construction for “phase shift” helps to clarify the meaning of this term. As I explained above, I believe the construction I have adopted for “phase shift” appropriately reflects the retrospective, contemporaneous, and prospective nature of phase shifts in the claims. Accordingly, in light of my construction for the term “phase shift,” I will construe this term to mean, “computing the amount by which a phase is adjusted for each carrier signal.”

10. “a phase shift for each carrier signal is [at least] based on” (’041 patent, claims 1 and 14; ’610 patent, claims 7 and 31; ’427 patent, claims 7 and 29)

- a. *Plaintiff’s proposed construction:* plain and ordinary meaning
- b. *Defendants’ proposed construction:* “a phase shift for each carrier signal is computed [at least] based on”
- c. *Court’s construction:* “a phase shift for each carrier signal is computed [at least] based on”

Plaintiff argues that Defendants have provided no justification for adding the word “computed” into their proposed construction for this term. (*Id.* at 99). According to Plaintiff, Defendants are attempting to impermissibly narrow the term’s scope. (*Id.* at 100). Defendants’

counter that their construction is correct in light of the intrinsic record, which makes clear that a phase shift is “computed.” (*Id.*).

At the *Markman* hearing, Plaintiff indicated that it would accept a construction that included the word “computed,” so long as “computed” is not understood to require a mathematical equation. (*See* Tr. at 112:23–113:4, 114:12–18). Plaintiff did not appear to dispute that “phase shift[s]” are computed. (*See id.* at 111:24–112:2). Accordingly, I will adopt Defendants’ proposed construction, “a phase shift for each carrier signal is computed [at least] based on.” The word “computed” is not limited, however, to a mathematical equation.

V. CONCLUSION

Within five days the parties shall submit a proposed order consistent with this Memorandum Opinion suitable for submission to the jury.